

# View Abstract

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TITLE: A machine-learning algorithm to distinguish benign and malignant adnexal tumours from ultrasound images

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ABSTRACT BODY:

Objectives: The accurate preoperative diagnosis of adnexal tumors as benign or malignant is pivotal to optimize patient management. We developed a Machine Learning (ML) Algorithm to characterize adnexal tumors as benign or malignant from ultrasound images.

Methods: Transvaginal and transabdominal 2D B-mode static ultrasound images of 100 adnexal tumors from the prospective IOTA 7 study in Queen Charlotte's and Chelsea Hospital in London were included in the study. The final histology was used as gold standard for all tumors, and the ROI were cropped by the operator. Then, an Adaptive noise reduction procedure is applied to the ROI. The collaboratively developed ML algorithm automatically extracts nine quantitative texture-based feature vectors of different dimensions: (F1) Gabor Filter; (F2) Fractal Dimension; (F3) Histogram of Gradient; (F4) Local Binary Pattern (LBP-256 Bins); (F5) 7-moments; (F6) Uniform LBP (ULBP-59); (F7) Statistics Histogram; (F8) Skewness and (F9) Kurtosis. The Support Vector Machine (SVM) classifier was used to train and test the discriminating diagnostic strength of these features. The software outputs the decision of each of the nine models as well as the fused majority voting decision of all, or an odd number of the singular decisions.

Results: The test of 100 cases (of which 44 malignant) revealed that performances vary with fusion configurations. Table 1 shows the details.

Conclusions: The ML software (version 2) classified static 2D B mode ultrasound images of adnexal tumors into benign and malignant categories with high accuracy. We aim to extend the clinical test with larger number of cases.

Additional details

KEYWORDS: Ovary, Cancer, Fallopian tubes.

TABLE:

Fused schemes	Total Error	Sensitivty	Specificity	Overall Accuracy
F1 alone	10	84.09%	94.64 %	90%
F6, F8, F9	10	93.18%	87.50 %	90%
F1, F2, F3, F4, F8	6	93.18%	94.64 %	94%
F1, F3, F4, F5, F6, F8, F9	9	90.91%	91.07 %	91%
All Features	7	93.18%	92.86 %	93%

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